CLAIMS

1. In a station of a wireless network, the station coupled to a network device by a network link, the network device including a memory, a method of streaming data over the network link from or to the network device memory during wirelessly transmitting or wirelessly receiving at the station, the method comprising:

    accepting information describing wherefrom to retrieve a data element including at least some of the data for a to-be-wirelessly-transmitted packet in the case of transmitting, or whereto write a data element including at least some of the data from a wirelessly received packet in the case of receiving, the accepted information including information defining a memory location and an amount data in the network device memory for said data element;

    setting up a DMA transfer of said data element for the to-be-wirelessly-transmitted packet in the case of transmitting, or from the wirelessly received packet in the case of receiving, the setting up using the defining information; and

    in the case of transmitting:

    converting the defining information to a packet of a first type for transport over the network link;

    sending the packet of the first type via the network link to the network device to be interpreted at the network device to set up sending said data element from the memory of the network device according to the defining information;

    receiving in response to the sending of the packet of the first type, a packet of a second type that includes said data element;

    converting the packet of the second type to said data element; and

    incorporating said data element into the packet for transmission,

    or,

in the case of receiving:

extracting said data element from the wirelessly received packet;

converting the defining information and encapsulating said data element into a packet of the second type for transport over the network link for said data element to be written into the memory of the network device; and

sending the packet of a second type to the network device to be interpreted at the network device to cause the encapsulated data to be written into the memory of the network device according to the defining information,

such that, in the case of transmitting, the transfer over the network of said data element for incorporation into a packet for wireless transmission occurs in real time during transmit time, or such that in the case of receiving, the transfer of said data element from a wirelessly received packet occurs in real time during receive time.

2.   A method as recited in claim 1, wherein the station is an access point of the wireless network.

3.   A method as recited in claim 1, wherein the wireless network conforms to one of the IEEE 802.11 standards or derivatives thereof.

4.   A method as recited in claim 3, wherein the packet is an 802.11 MAC packet.

5.   A method as recited in claim 1, wherein the network device is a network switch that includes a memory wherefrom data is streamed during the wireless transmitting or whereto data is streamed during the wireless receiving.

6.   A method as recited in claim 5, wherein the network is a Gigabit Ethernet or an Ethernet at least as fast as a Gigabit Ethernet.

7.   A method as recited in claim 1, wherein setting up of the DMA transfer is part of a set of a scatter/gather DMA transfer of a plurality of data elements.

8.   In a network device coupled by a network link to a wireless station of a wireless network, the network device including a memory, a method of streaming data over the

network link from or to the network device memory during wirelessly transmitting or during wirelessly receiving at the station, the method comprising:

sending information over the network link to the wireless station describing wherefrom to retrieve a data element including at least some of the data for a to-be-wirelessly-transmitted packet in the case of transmitting, or whereto write a data element including at least some of the data from a wirelessly received packet in the case of receiving, the accepted information including information defining a memory location and an amount data in the network device memory for said data element; and

in the case of data for a to-be-transmitted packet, in response to the receiving of the packet of the first type:

receiving from the wireless station via the network link a packet of the first type, the packet of the first kind including information describing wherefrom to retrieve said data element;

retrieving said data element from the memory;

forming a packet of a second type that includes the retrieved data; and

sending the packet of a second type to the wireless station in response to the receiving,

or,

in the case of data from a received packet:

receiving a packet of a second type from the wireless station encapsulating said data element and including information describing whereto write said data element;

extracting the encapsulated data from the packet of the second type;

writing the extracted data into the memory according to information in the received packet of the second kind,

such that, in the case of transmitting, the transfer of data over the network for incorporation into a packet for wireless transmission occurs in real time during transmit time, or such that in the case of receiving, the transfer of data over the network from a wirelessly received packet occurs in real time during receive time.

9.   A method as recited in claim 8, wherein the station is an access point of the wireless network.

10.   A method as recited in claim 8, wherein the wireless network conforms to one of the IEEE 802.11 standards or derivatives thereof.

11.   A method as recited in claim 10, wherein the packet is an 802.11 MAC packet.

12.   A method as recited in claim 8, wherein the network device is a network switch.

13.   A method as recited in claim 12, wherein the network is a Gigabit Ethernet or an Ethernet at least as fast as a Gigabit Ethernet.

14.   A method as recited in claim 8, wherein setting up of the DMA transfer is part of a set of a scatter/gather DMA transfer of a plurality of data elements.

15.   An apparatus in a wireless station operable in a wireless network, the apparatus comprising:

a local memory able to receive information describing a location wherefrom a data element including at least some of the data for a to-be-wirelessly transmitted packet is to be obtained, the location being in a memory of a network device coupled by a network link to the wireless station;

a packet/DMA engine coupled to the local memory, the packet DMA engine able to set up a DMA transfer of data for the to-be-wirelessly-transmitted packet, the setting up using the received information in the memory and forming information defining a set of at least one location in the memory of the network device; and

a network interface coupled to the packet/DMA engine, the network interface including a network DMA engine able to accept DMA requests for transfer of data, the network DMA engine able to convert defining information to a packet of a first

type and to cause the network interface to send the packet of the first kind over a network to which the network interface is coupled, such that a compatible network device can interpret and retrieve the data defined by the defining information, the network interface further able to recognize and provide the network DMA engine a packet of a second type received over a network link, the packet of the second type including data defined by defining information, the network DMA engine further able to convert the provided packet of the second type to data included therein,

such that, in the case that the station is coupled to a first network, and a first packet of the second type is received over the first network from a first network device also coupled to the first network, said receiving of the first packet of the second type being in response to the sending of a first packet of the first kind, and said sending of the first packet is as a result of the network DMA engine accepting a first DMA request that defines data to be retrieved from a memory of the first network device, the network DMA engine responds to the first DMA request with the data defined in the first DMA request, and

such that transfer of data over the first network for incorporation into a packet for wireless transmission can occur in real time during transmit time.

16.   An apparatus as recited in claim 15,

wherein the local memory is further to receive information describing a location to where an element of data from a wirelessly received packet is to be stored, the location in a memory of a network device coupled by a network link to the wireless station,

wherein the packet/DMA engine using the received information in the memory is further able to set up a DMA transfer of a data element including at least some of the contents of the wirelessly received packet,

wherein the network DMA engine is further able to form a packet of a second type including the data element defined by defining information in a DMA request, and

wherein the network interface is further able to send the formed packet of the second type,

such that, in the case that the station is coupled to the first network and the first network device is also coupled to the first network, a first packet of the second type is sent over the first network to the first network as a result of the network DMA engine accepting a first DMA request that defines data to be sent to the memory of the first network device, and

such that the transfer of data over the network from a wirelessly received packet occurs in real time during receive time.

17.   An apparatus as recited in claim 15, the apparatus further comprising:

      a host processor coupled to a host bus subsystem; and

      a host DMA controller coupled to the host subsystem,

wherein the packet/DMA engine is also coupled to the host bus subsystem and able to communicate to the host DMA controller,   such that the packet DMA engine's setting up a DMA transfer includes the packet DMA engine instructing the host DMA controller to set up the DMA transfer, and   such that the network DMA engine appears to the host DMA controller as a memory interface,

wherein the local memory is further to receive information describing a location to where an element of data from a wirelessly received packet is to be stored, the location in a memory of a network device coupled by a network link to the wireless station,

wherein the packet/DMA engine using the received information in the memory is further able to set up a DMA transfer of a data element including at least some of the contents of the wirelessly received packet,

wherein the network DMA engine is further able to form a packet of a second type including the data element defined by defining information in a DMA request, and

wherein the network interface is further able to send the formed packet of the second type.

18.   A method as recited in claim 17, wherein the packet/DMA engine includes a scatter/gather DMA controller to set up the transfer of a plurality of data elements.

19.   A method as recited in claim 15, wherein the station is an access point of the wireless network.

20.   A method as recited in claim 15, wherein the wireless network conforms to one of the IEEE 802.11 standards or derivatives thereof.

21.   A method as recited in claim 20, wherein the packet is an 802.11 MAC packet.

22.   A method as recited in claim 15, wherein the network device is a network switch that includes a memory wherefrom data is streamed during the wireless transmitting.

23.   A method as recited in claim 22, wherein the network is a Gigabit Ethernet or an Ethernet at least as fast as a Gigabit Ethernet.

24.   A method of wirelessly transmitting a packet of information, the method comprising

    streaming a data element including at least some of the contents of the packet over a network link during transmit time; and

    transmitting the packet of information.

25.   A method as recited in claim 24, wherein the transmitting is by a station of a wireless network and the streaming is to the station from a network device coupled to the station by the network link.

26.   A method as recited in claim 25, wherein the station is an access point of the wireless network.

27.   A method as recited in claim 25, wherein the wireless network conforms to one of the IEEE 802.11 standards or derivatives thereof.

28.   A method as recited in claim 27, wherein the packet is an 802.11 MAC packet.

29.   A method as recited in claim 25, wherein the network device is a network switch that includes a memory wherefrom data is streamed during the wireless transmitting.

30.   A method as recited in claim 29, wherein the network is a Gigabit Ethernet or an Ethernet at least as fast as a Gigabit Ethernet.

31.   A method as recited in claim 25, wherein the network device includes a memory wherefrom data is streamed during the wireless transmitting, the method further comprising:

forming a DMA request for said data element;

converting the formed DMA request to a first packet for transport over the network;

sending the first packet to the network device over the network;

receiving a second packet over the network from the network device, said second packet containing said data element; and

responding to the formed DMA request with said data element from the second packet,

such that the streaming of said data element of the data uses the second packet.

32.   A method as recited in claim 31, further comprising:

receiving from the network device information regarding where data for wireless transmission resides in the memory of the network device,

such that the forming of the DMA request uses the received information.

33.   A method as recited in claim 31, wherein the network is a Gigabit Ethernet or an Ethernet at least as fast as a Gigabit Ethernet, and wherein the network device is a network switch, wherein the wireless network is a network conforming to one of the IEEE 802.11 standards or a derivative thereof, and wherein the first and second packets are respectively Ethernet packets of a first type and a second type.

34.   A method of wirelessly receiving a packet of information, the method comprising

wirelessly receiving a packet of information; and

streaming a data element including at least some of the contents of the packet over a network link during receive time.

35.   A method as recited in claim 34, wherein the receiving is by a station of a wireless network and the streaming is from the station to a network device coupled to the station by the network link.

36.   A method as recited in claim 35, wherein the station is an access point of the wireless network.

37.   A method as recited in claim 35, wherein the wireless network conforms to one of the IEEE 802.11 standards or derivatives thereof.

38.   A method as recited in claim 37, wherein the packet is an 802.11 MAC packet.

39.   A method as recited in claim 35, wherein the network device is a network switch that includes a memory whereto data is streamed during the wireless receiving.

40.   A method as recited in claim 39, wherein the network is a Gigabit Ethernet or an Ethernet at least as fast as a Gigabit Ethernet.

41.   A method as recited in claim 35, wherein the network device includes a memory whereto data is streamed during the wireless transmitting, the method further comprising:

    forming a DMA instruction for writing at said data element;

    converting the formed DMA request to a first packet for transport over the network;

    sending the first packet to the network device over the network;

    encapsulating said data element into a second packet for transport over the network to the network device; and

    sending the second packet over the network to the network device for writing into the memory of the second device according to the formed DMA instruction,

such that the streaming of said data element of the data uses the second packet.

42.   A method as recited in claim 41, further comprising:

receiving from the network device information regarding where wirelessly received data is to be written in the memory of the network device,

such that the forming of the DMA request uses the received information.

43.   A method as recited in claim 43, wherein the network is a Gigabit Ethernet or an Ethernet at least as fast as a Gigabit Ethernet, and wherein the network device is a network switch, and wherein the wireless network is a network conforming to one of the IEEE 802.11 standards or a derivative thereof, and wherein the first and second packets are respectively Ethernet packets of a first type and a second type.

44.   An apparatus to wirelessly transmit a packet of information, the apparatus including:

means for wirelessly transmitting a packet of information; and

means for streaming a data element, including at least some of the contents of the packet, over a network link during transmit time.

45.   An apparatus as recited in claim 44, wherein the transmitting is in a station of a wireless network, and wherein the streaming is from a network device coupled to the wireless station by the network link.

46.   A carrier medium carrying a set of machine readable instructions to instruct a machine to carry out a method of wirelessly transmitting a packet of information, the method including:

streaming a data element, including at least some of the contents of the packet, over a network link during transmit time.

47.   A carrier medium as recited in claim 46, wherein the transmitting is in a station of a wireless network, and wherein the streaming is from a network device coupled to the wireless station by the network link.

48.   An apparatus to wirelessly receive a packet of information, the apparatus including:

means for wirelessly receiving a packet of information; and

means for streaming a data element, including at least some of the contents of the received packet, over a network link during transmit time.

49.   An apparatus as recited in claim 48, wherein the receiving is in a station of a wireless network, and wherein the streaming is to a network device coupled to the wireless station by the network link.

50.   A carrier medium carrying a set of machine readable instructions to instruct a machine to carry out a method of wirelessly receiving a packet of information, the method including:

streaming a data element, including at least some of the contents of the received packet, over a network link during transmit time.

51.   A carrier medium as recited in claim 50, wherein the receiving is in a station of a wireless network, and wherein the streaming is to a network device coupled to the wireless station by the network link.